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Dr Wahl
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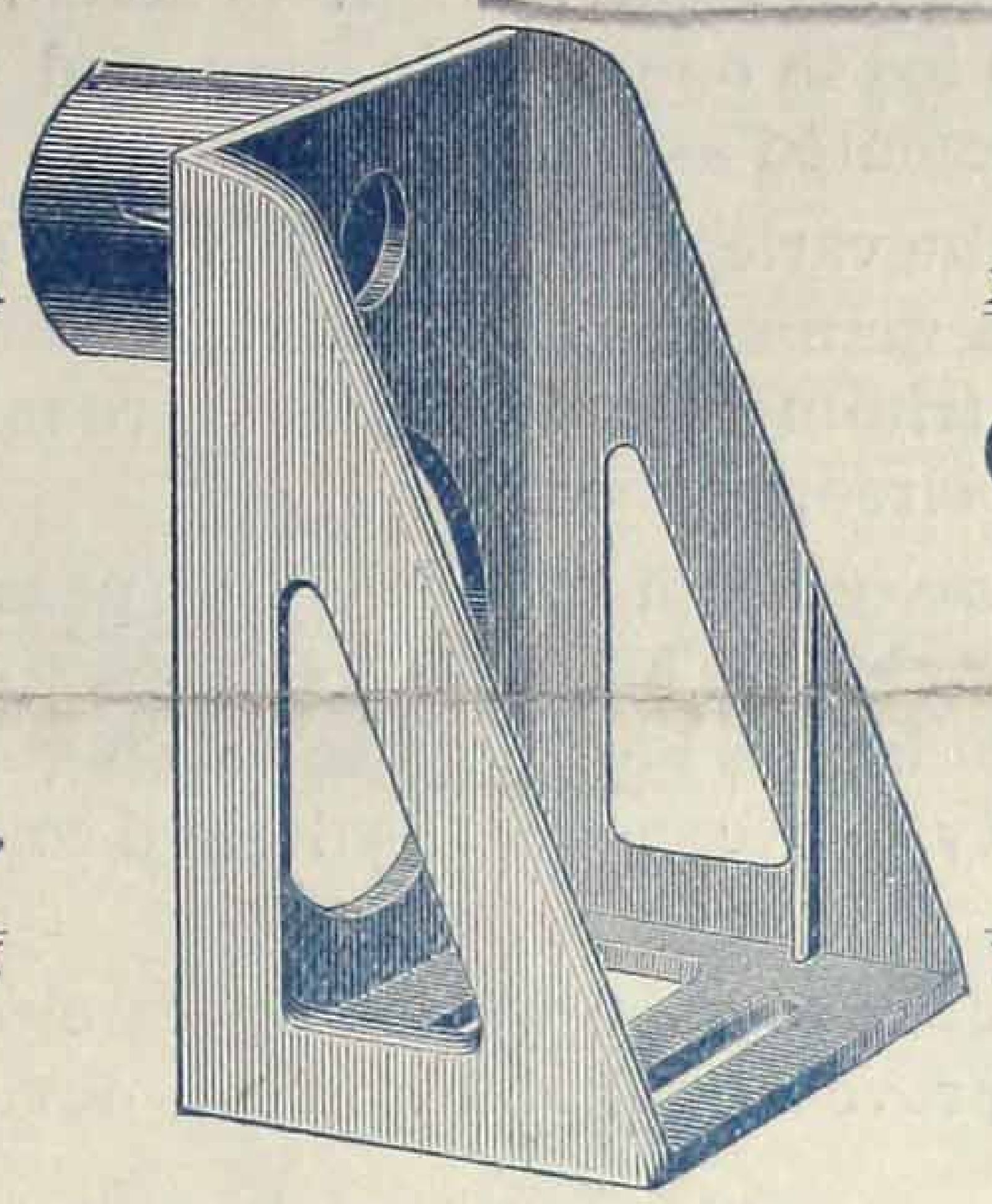
IMPORTANT

TO

Engineers, * Architects * and * Builders.

THE DUPLEX JOIST HANGER.



PATENTED OCTOBER 29, 1889.

EVERY HANGER TESTED.

GUARANTEED TO HOLD 40,000 POUNDS.

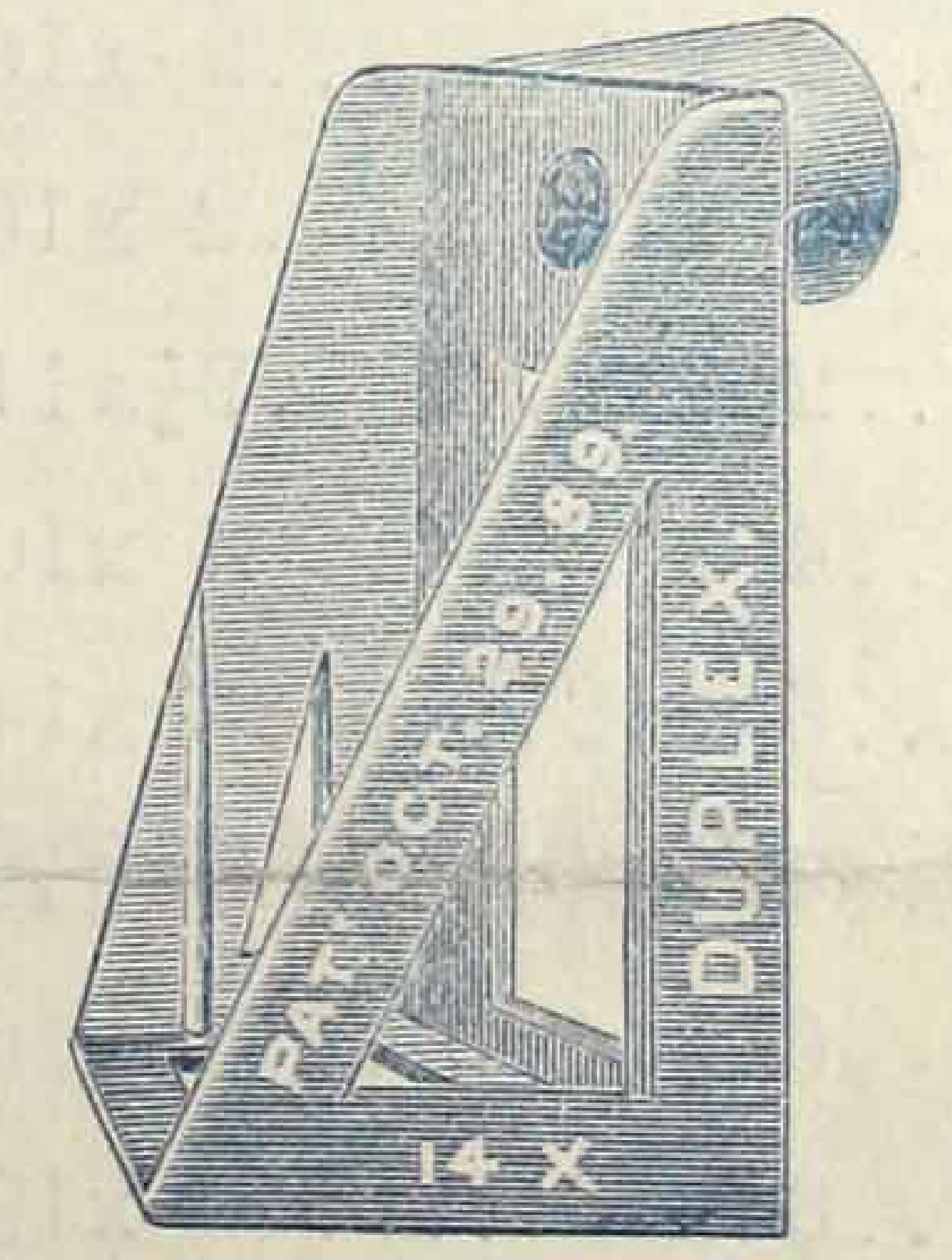
A SIMPLE, INEXPENSIVE AND SERVICEABLE INVENTION.

SAVES MONEY, TIME AND LABOR.

Abolish the Ancient Mortise and Tenon and Secure a Stirrup for a Less Cost.

THE ONLY SAFE METHOD FOR FRAMING

ANGLE HANGER 45 DEG.



Ceiling Joists, Headers, Trimmers, Tail Joists, Beams, Etc.,

BEING ESPECIALLY ADAPTED TO

CHIMNEY, STAIR, LIGHT WELL, ELEVATOR AND ANY OTHER OPENINGS,

CELLAR BEAMS, CEILING JOISTS AND ROOF TRUSSES, ETC.

MANUFACTURED BY THE

DUPLEX HANGER COMPANY,

23 & 25 WATER ST.,
CLEVELAND, - - OHIO.

FOR SALE BY ALL DEALERS IN BUILDERS' HARDWARE.

In presenting these Hangers to the public we desire to call your attention to a few facts in regard to timber construction, and show a method for framing same which will insure the most secure and economical use of the timber, the importance of which is fully appreciated by all

ARCHITECTS AND BUILDERS.

Whom experience has taught the evils resulting from different methods of framing by mortise and tenon, we need only say that by the use of this Hanger, the full value and strength of the timber may be utilized, a result which no way of mortise and tenon framing can accomplish. The difficulty of having work done as specified, and the annoyance to a sensitive mind of having work done just good enough to avoid being condemned, may be overcome by the use of these hangers, which can only be applied in one simple way, and when in place do, by their presence, give positive assurance that the work has been executed as intended.

To those who have been annoyed by the variety of shapes and sizes of wrought iron stirrups, and who desire to have their work executed in as substantial a manner as the materials used will permit, we recommend a trial of these Duplex Joist Hangers, for framing headers, trimmers and tail joists around stairs, fire-places, elevators, chimneys or any other opening where good framing is desired,

How often does an unsightly but necessary beam in the ceiling puzzle an architect, which when concealed by notching the joists on a small strip nailed to side of beam, overcomes the objectionable feature of the ceiling, but worries the designer with the knowledge that he has sacrificed the strength of his floor for the beauty of the ceiling. By the use of the Hanger there is no difficulty to overcome, the desired ceiling is obtained and the strength of the joists remain intact.

To contractors whose timber and labor are so often wasted by careless and indifferent mechanics, this simple, inexpensive and serviceable invention will prove a profitable and safe device.

APPLICATION AND PRICE LIST

OF

DUPLEX JOIST HANGERS.

NUMBER OF HANGER.	APPLIED TO JOISTS OF	PRICE OF HANGER.
10	2 x 6........2 x 8......2 x10............	30 cts.
14	2 x12........2 x14......2 x16...........	35 "
18	2½x10........2½x12......2½x14.......2½x16	40 "
20	4 x 6........4 x 8..... 4 x10...........	45 "
21	3 x10........3 x12......3 x14.......3 x16	45 "
28	4 x12........4 x14......4 x16...	65 "
*35 Right,	6 x12... ....6 x14......6 x16 ......8 x12	75 "
*35 Left,	8 x14........8 x16.....10 x12 ......10x14	75 "
45° Angle.	2x6....2x8....2x10....2x12....2x14...2x16	45 "
	* No. 35 Right and Left used in pairs bolted together	

In conclusion, we wish to say that the Hangers are all made of the best wrought steel, samples of which, when tested, have proven of far better quality than the wrought iron used for stirrups. That they are of a uniform size and shape and are obtainable on short notice from any dealer in builder's supplies. The expense incurred by their use does not cost that which good mortise and tenon work would cost, and they are now offered to the public after thorough tests as to their strength and reliability.

The Duplex Hanger Company.

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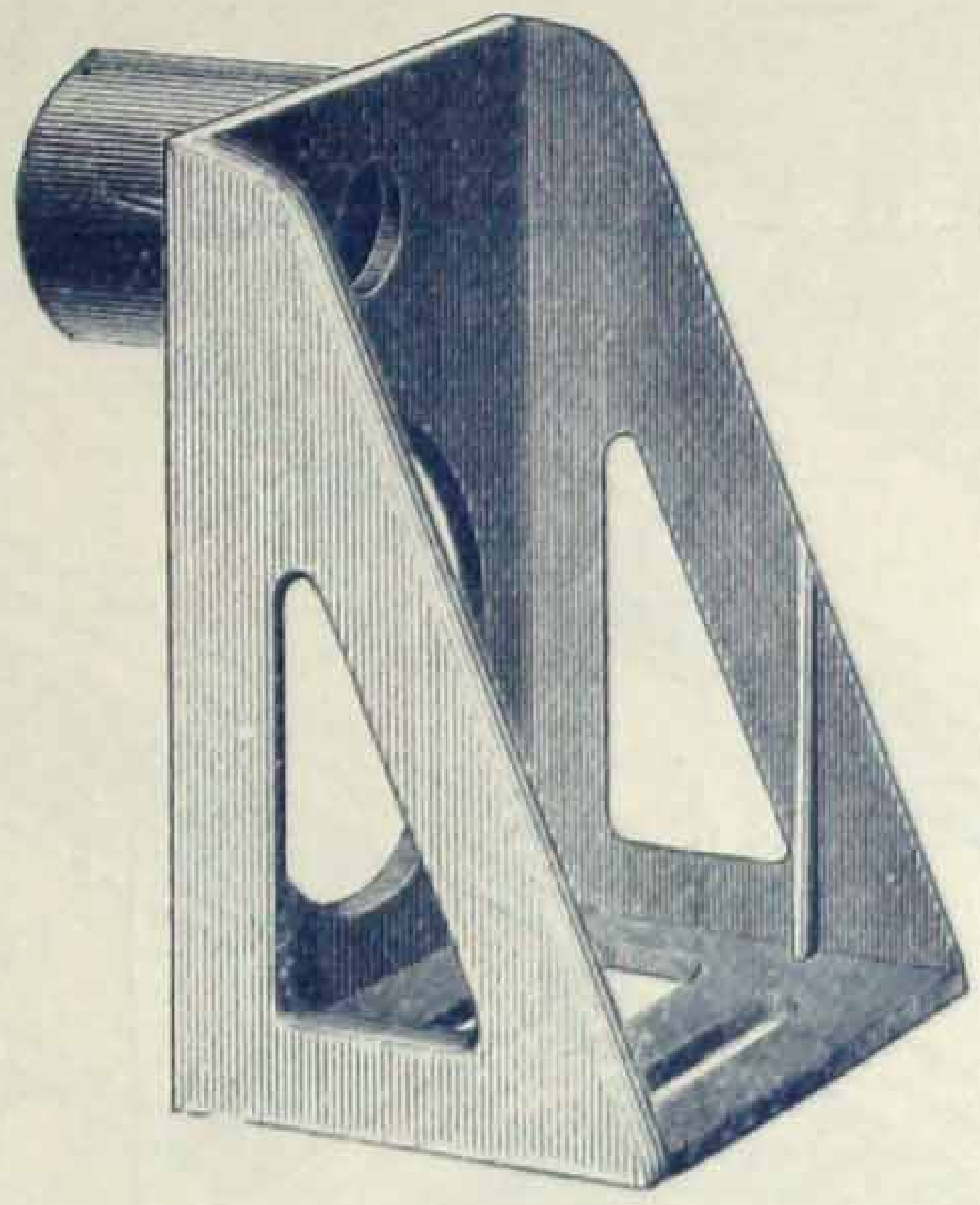
PRICE LIST

OF

Duplex Joist Hangers.

FEBRUARY 1, 1891.



NUMBER OF HANGER.	APPLIED TO JOISTS OF	PRICE OF HANGER.
10	2 x 6........2 x 8......2 x10............	30 cts.
14	2 x12.... ...2 x14......2 x16............	35 "
18	2½x10 ....2½x12......2½x14... ...2½x16	40 "
20	4 x 6........4 x 8..... 4 x10............	45 "
21	3 x10........3 x12......3 x14.......3 x16	45 "
28	4 x12........4 x14......4 x16...	65 "
*35 Right,	6 x12... ....6 x14......6 x16 ......8 x12	75 "
*35 Left,	8 x14.... ...8 x16.....10 x12 ......10x14	75 "
45° Angle.	2x6....2x8....2x10....2x12....2x14...2x16	45 "
	* No. 35 Right and Left used in pairs bolted together	

These Hangers are now made out of wrought steel japanned to keep from rusting and are tested at 40,000 lbs. pressure.

The only Joist Hangers on the market that can be handled by the hardware trade, as only 7 sizes necessary to fit any size joist.

DUPLEX HANGER CO.,
23 & 25 WATER ST., CLEVELAND, O.

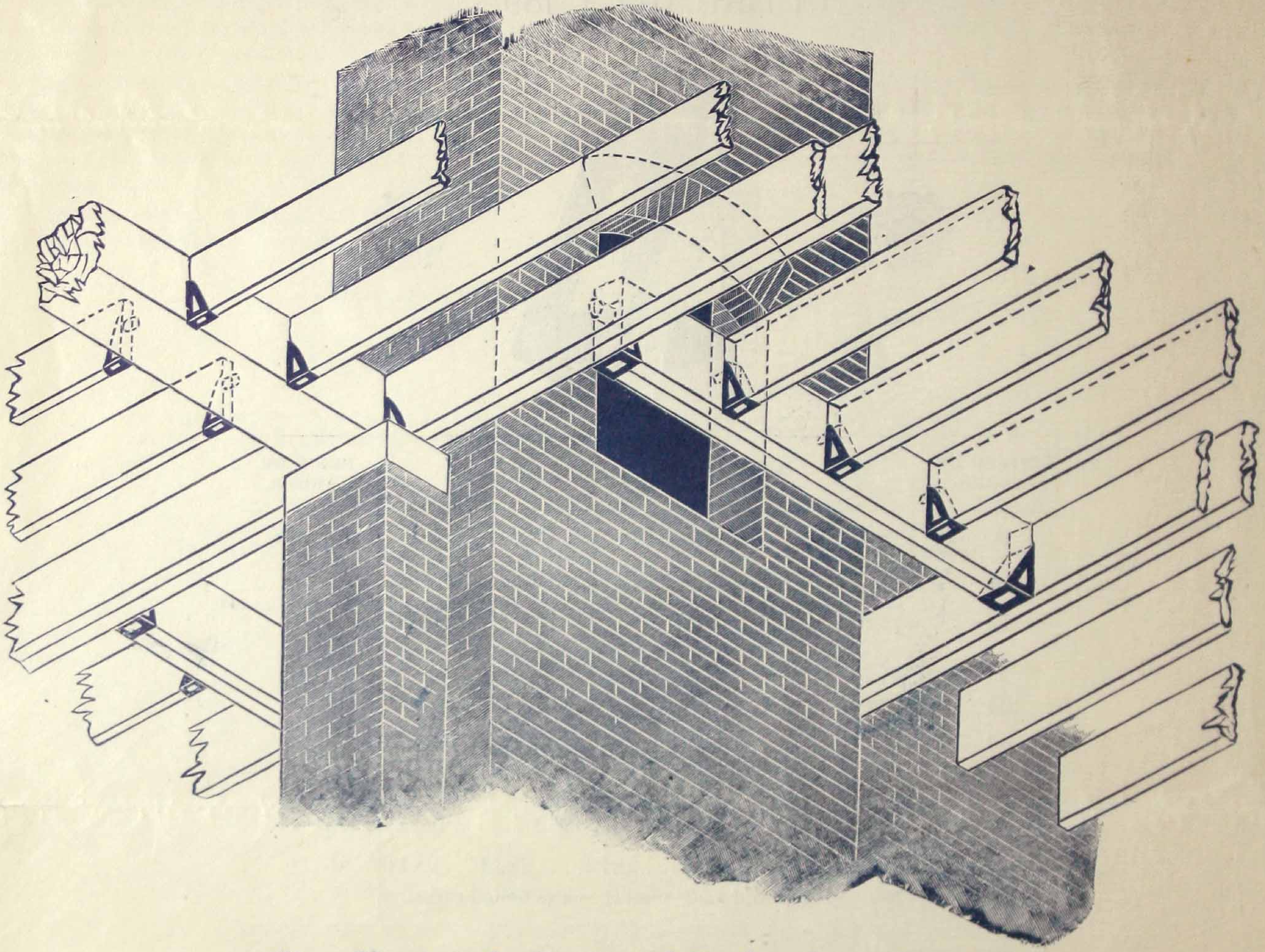
TD 90-81496 TCF

ARCHITECTS AND BUILDERS ATTENTION!

ABOLISH

The ancient mortise and tenon and use the Duplex Joist Hanger at a less cost and with greater security.

THESE HANGERS ARE TESTED AT 40,000 LBS. PRESSURE.



View Showing Application of Duplex Joist Hanger.

FOR SALE AT ALL DEALERS IN BUILDERS' HARDWARE.

DUPLEX HANGER CO.,

23 & 25 Water Street. CLEVELAND, OHIO.

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The following cuts and tables were prepared from tests made by the Otis Steel Co., Limited, of Cleveland, Ohio, and are here given to fully illustrate the properties and application of the DUPLEX JOIST HANGER and the advantages of their use.

Fig. 1.—Showing basis for strength of Timber used in table.
Fig. 2.—Sectional view, showing application of hanger.
Fig. 3.—End view, showing application of hanger.
Fig. 4.—Table showing strength of malleable iron.
Fig. 5.—Table showing strength of timber.
Fig. 6.—Table showing sizes and properties of hangers.
Fig. 7.—Showing view of No. 35 L, with anchor bolt.
Fig. 8.—Showing view of No. 35, R and L, with anchor bolt.

FIG. 1.

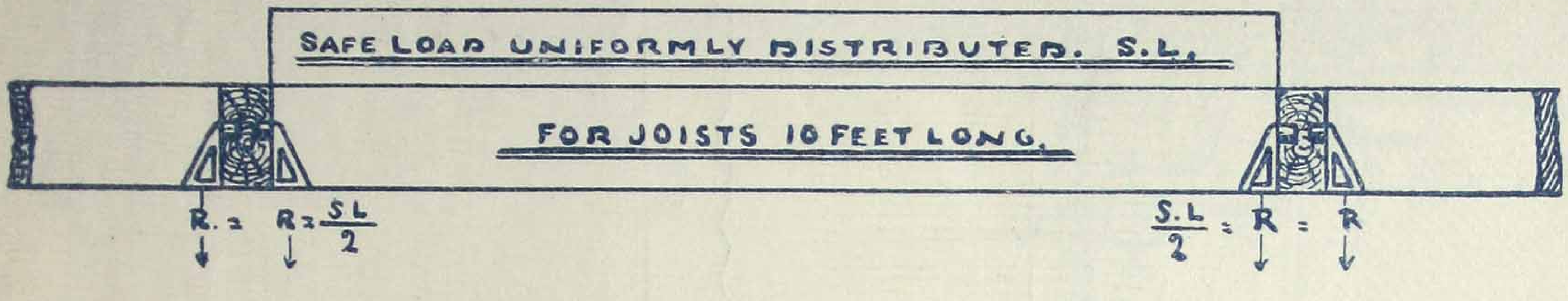


FIG. 4.

RESULTS OF TESTS.

Strength of Mall. Iron per sq. in

TENSION.	SHEARING.
44000	33000

FACTOR 4.

10000	7500

Crushing Strength of Wood per Sq. In.

4000	FACTOR 4.	1000

FIG. 2

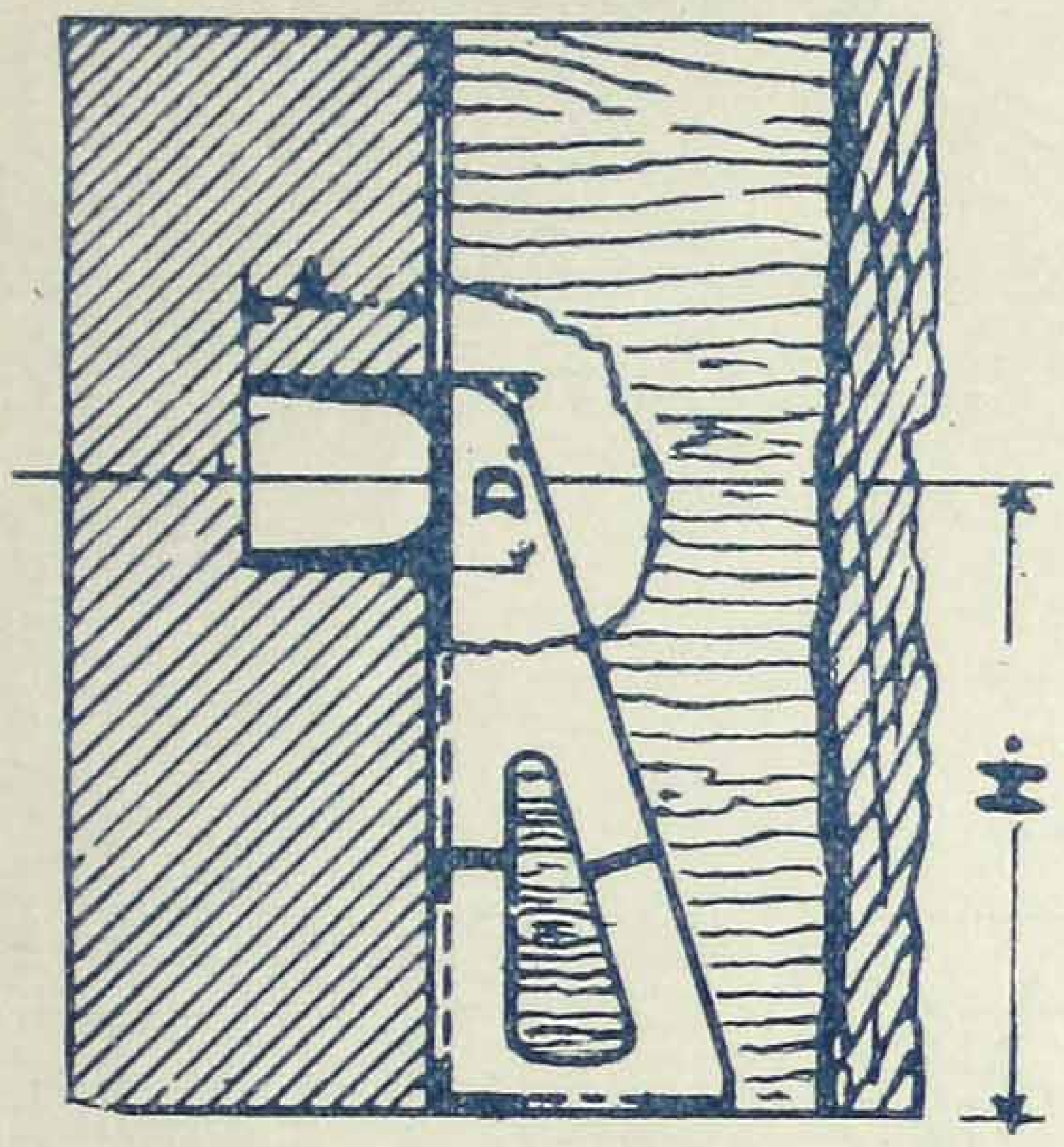


FIG. 3.

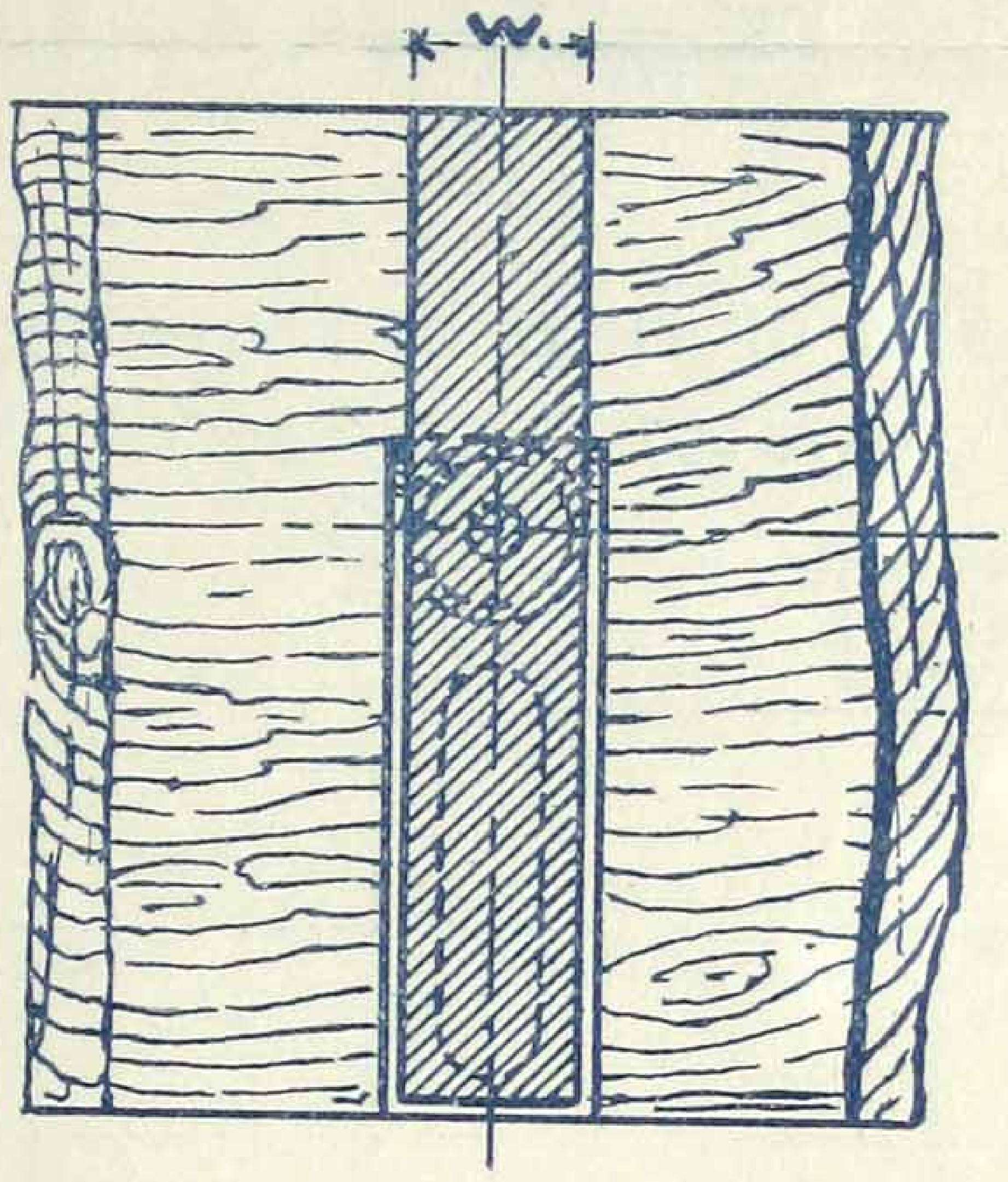


FIG. 5.

RESULTS OF TESTS

SIZE OF JOISTS.	S. L.	R.
2 x 10	2660	1330
2 x 12	3840	1920
2 x 14	5220	2610
2½ x 14	8520	3260
3 x 14	7830	3915
4 x 10	5320	2660
4 x 12	7680	3840
4 x 14	10440	5220
6 x 14	15660	7830
10 x 14	27100	13550

PROPERTIES OF DUPLEX JOIST HANGERS.

FIG. 6.

NO. OF HANGER.	SIZE OF JOIST.	INCHES.		BEARING AT L D				TEN. STR.		SHEAR STR.		R
		W	H	L	D	AREA x 1000		AREA x 10000 E F		AREA x 7500 A B		
10	2 x10	2.03	5	1.75	1.50	2 625	2625	0.585	5850	1.00	7500	1330
	2 x12	"	"	"	"	"	2625	"	5850	"	7500	1920
14	2 x14	2.03	7	2.00	1.75	3.50	3500	0.585	5850	1.41	10800	2610
18	2½x14	2.53	7	2.00	1.75	3.50	3500	0.585	5850	1.44	10800	3260
21	3 x14	3.06	7	2.50	2.00	5.00	5000	0.64	6440	1.60	12000	3915
20	4 x10	4.06	5	1.75	1.75	3.062	3062	0.90	9000	1.295	9712	2660
	4 x12	"	"	"	"	"	3062	"	9000	"	9712	3840
28	4 x14	4.60	7	2.75	2.50	6.875	6875	0.775	7775	2.43	18225	5220
a	6 x14	6.00	7	3.00	2.50	7.50	7500	1.75	17500	2.43	18225	7830
*35 *b*	6 to 10 x14	10.00	7	3 00	2.50	Total, 15.00	15000	Total, 3.50	35000	Total, 4.86	36450	13550

*—In pairs, right and left hand. *a*—Right or left hanger. *b*—Right and left hand hanger bolted together.

FIG. 7.

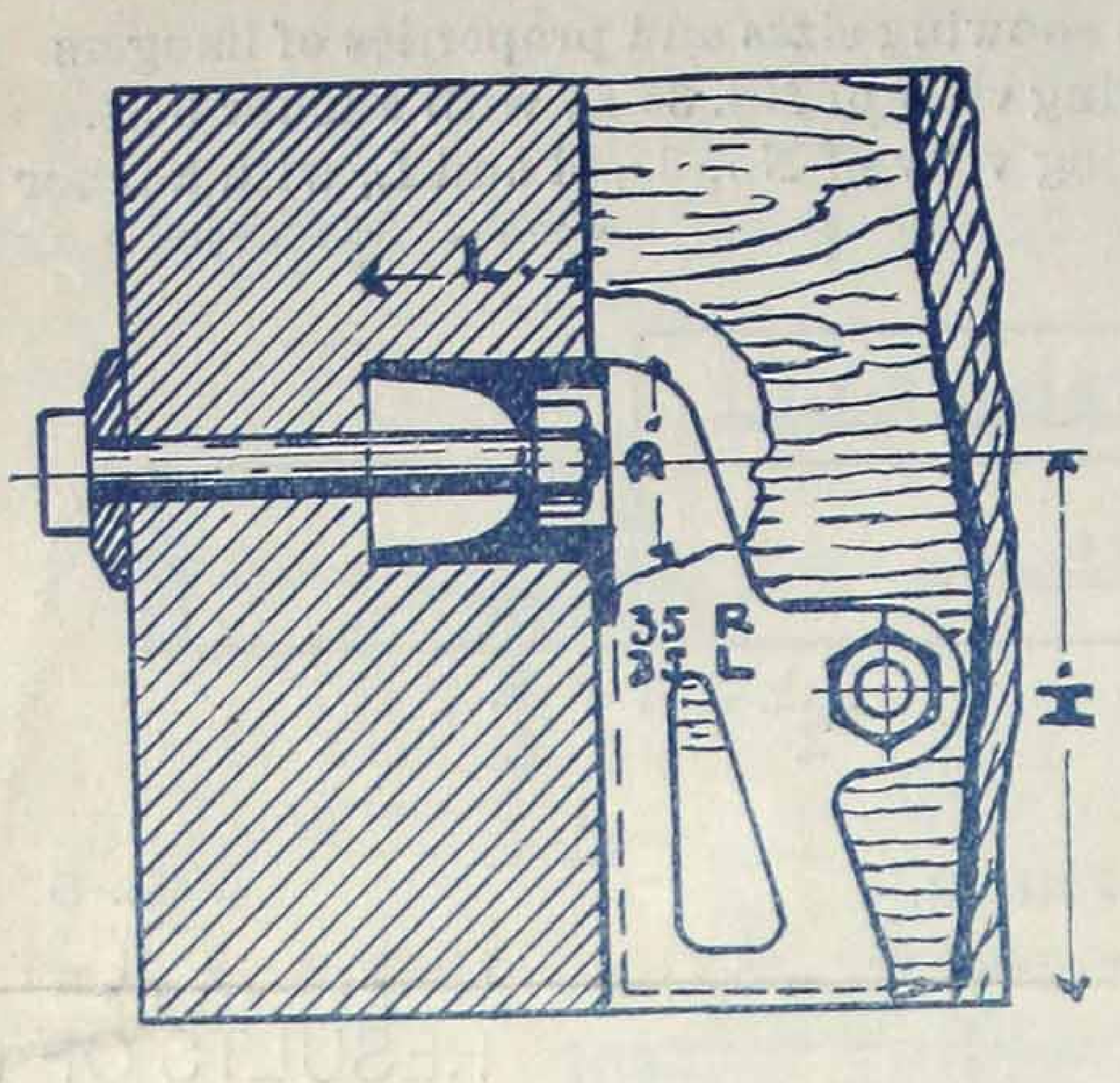
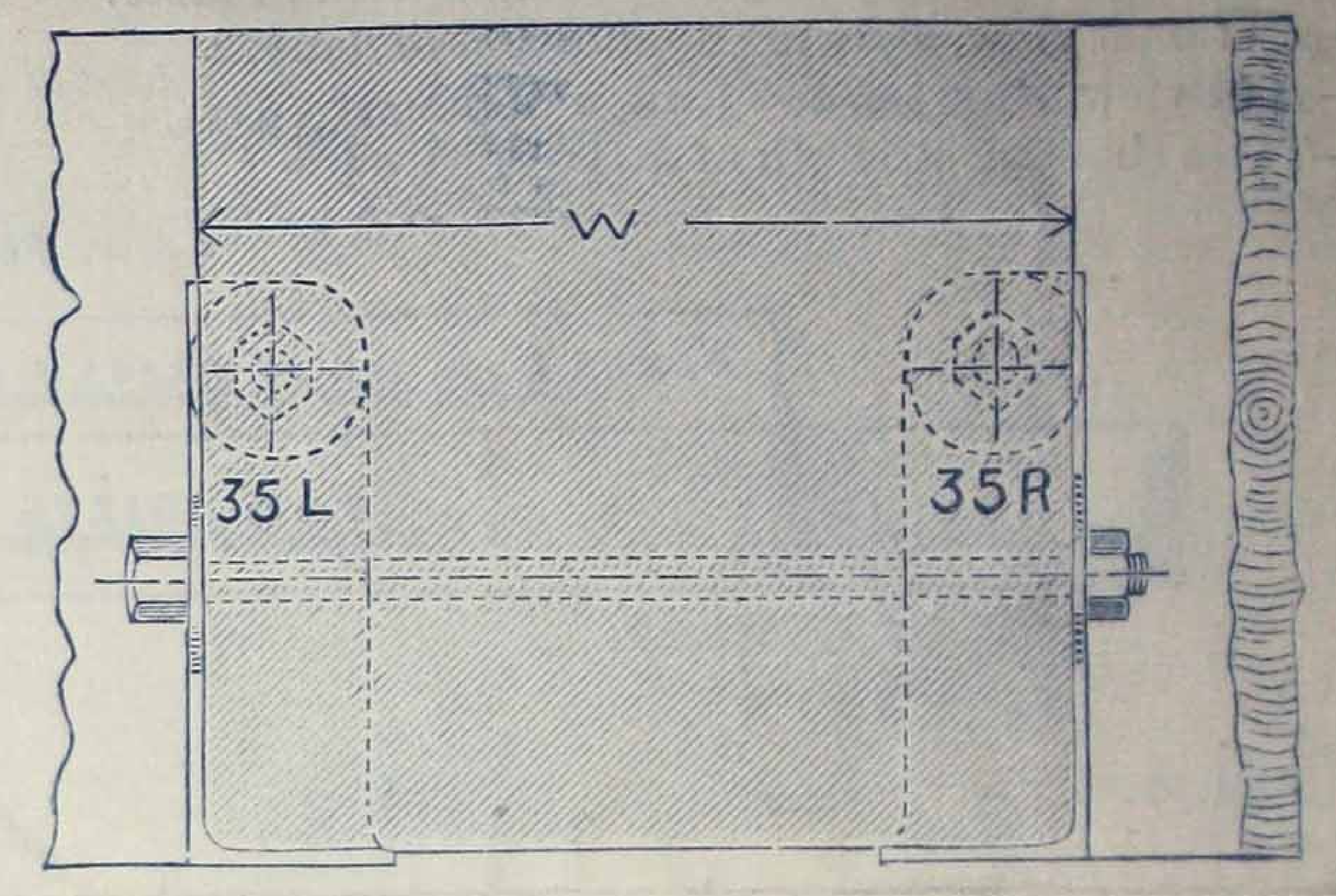
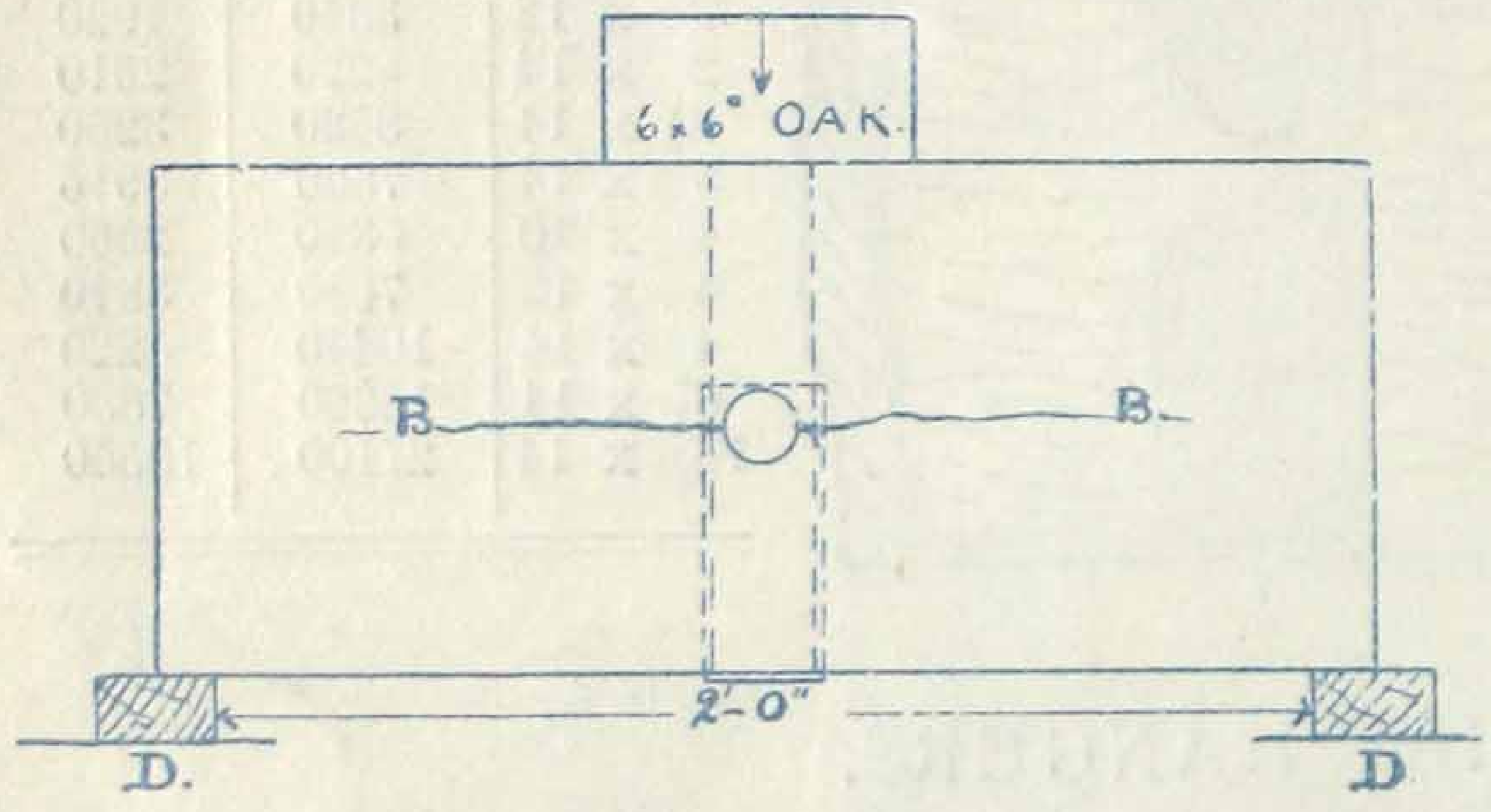
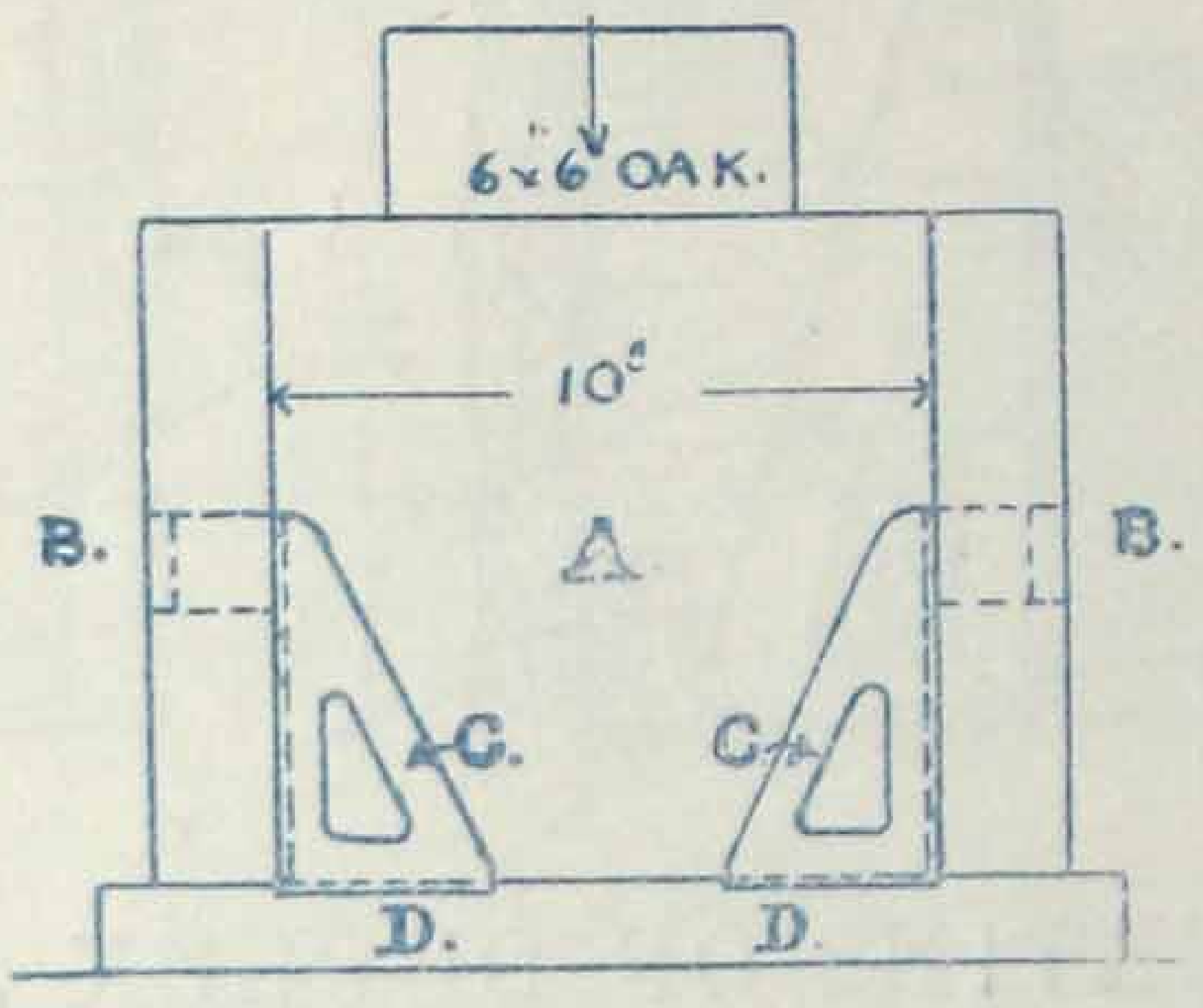


FIG. 8.



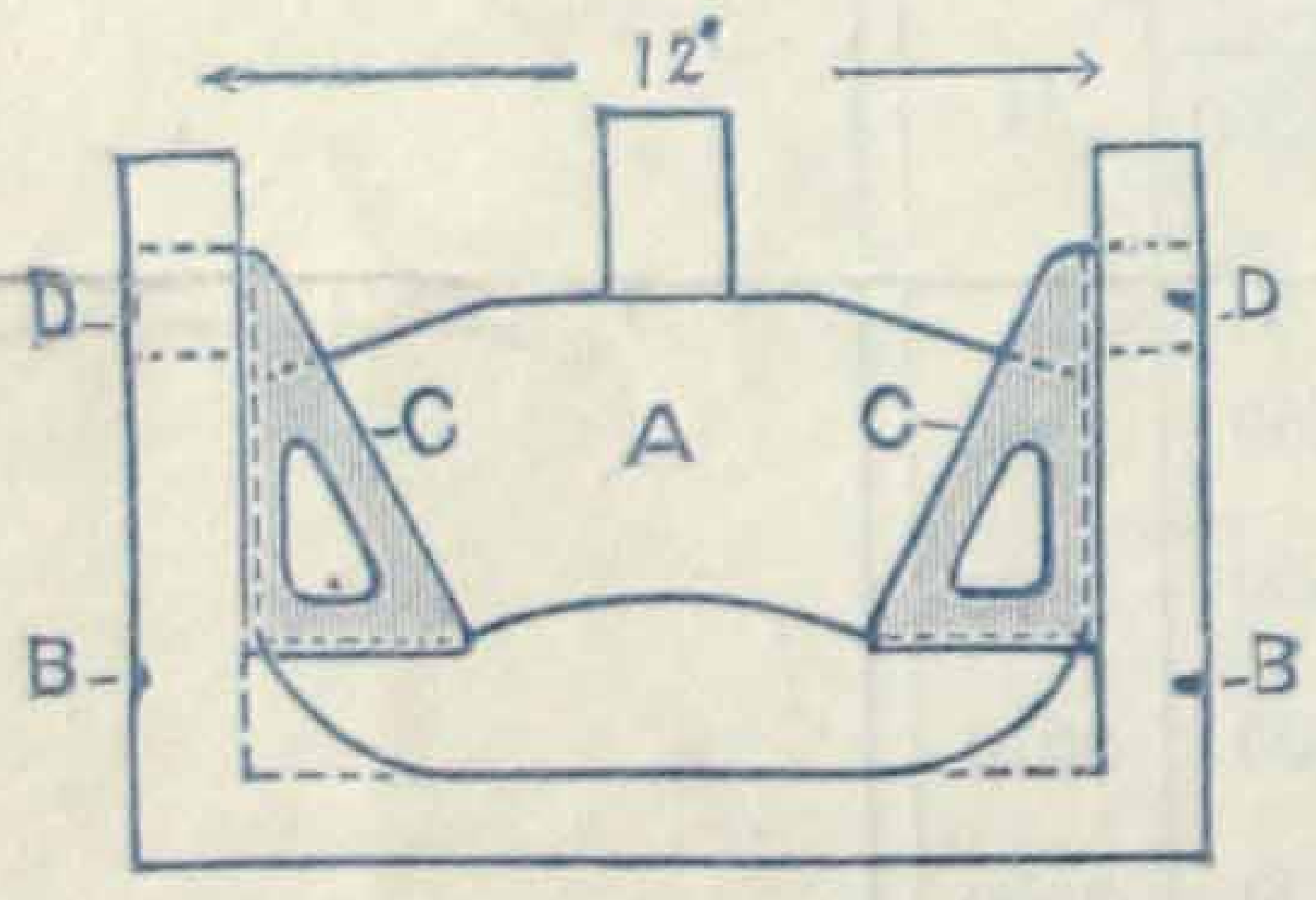
RESULT OF TESTS OF THE DUPLEX JOIST HANGERS MADE BY THE
OTIS STEEL COMPANY, LIMITED, OF CLEVELAND, OHIO.

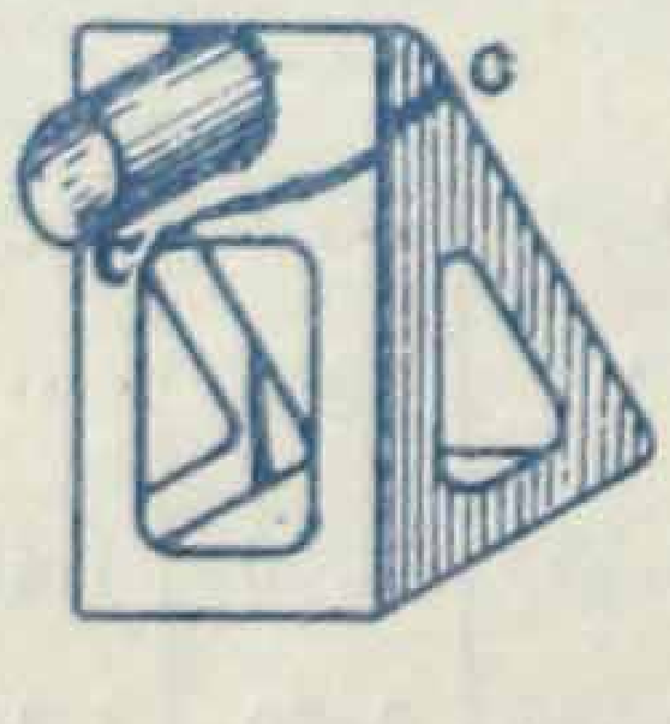




TEST No. 1—A, 2 in. by 10 in , 10 in. long. B and B, 2 in. by 10 in., 2 ft. 6 in. long with A framed in center. Ends of B and B supported on oak blocks. D-D, C-C, 2 in. by 5 in., hanger framed in center of B. 1st strain **500** lbs., strain continued at intervals, **500** lbs. up to **6,000** lbs., when hanger showed a settlement in hole of 1-32 in., on removing strain the hole in wood resumed its natural form. At **7,850** lbs. strain, wood showed signs of splitting in center of hole. and at **9,400** lbs. both joists badly split and showed a crush of ⅛ in. in hole which went back to 1-16 in. after 4 days, the density of wood in hole under bearing having increased about one-half.

TEST No. 2.—Same as test No. 1, only the hangers, C-C, were framed into joists, B-B, one inch above the center. Strain ran up to **8,000** lbs., rest ten minutes, when a slight split was observed, and the hanger crushed into hole about 1-16 in and at **9,000** lbs. joist split, at **10,000** lbs. badly split. and hanger crushed into wood 3-16 in., which returned to ⅛ in. scant after four days.

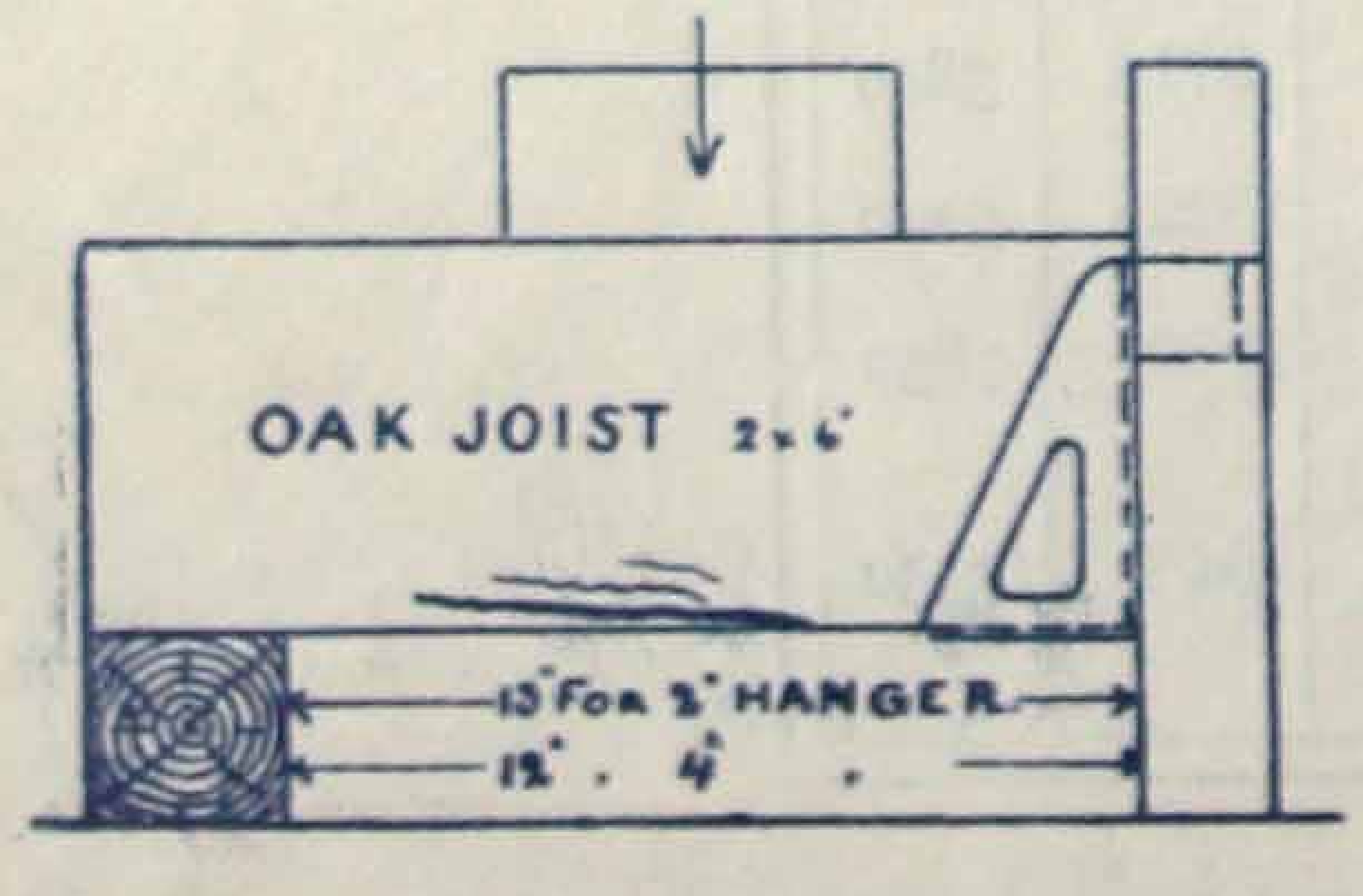




TEST No. 3.—A, Cast Iron Beam. B-B, Cast Iron Frame. C-C, Duplex Hanger. D-D, Hole drilled for Hanger. Total area of cross section of one hanger A—B=0.585 sq. in. Started test with a strain of **10,000** lbs. at **25,000** lbs strain, permanent set; at **40,200** lbs. strain, slight shearing; at **43,800** lbs. strain, one hanger broke at C-C, the other started breaking around bottom of nipple. Stretch in body of hanger in ¼ in. in 4½ in. Body of hanger does not show any rupture.

This is to certify that Tests Nos. 1, 2 and 3, described on sheets 1, 2 and 3, date of October 24, accompanying this, were made on our Testing Machine and that above sheets are a correct report of Tests.

OTIS IRON & STEEL CO.
G. B.



TEST No. 4.—This is to certify that two malleable iron hangers, received from the Duplex Hanger Co., were tested by us as shown in appended sketch. Weight applied vertically at middle of joist. 2 in. hanger, weight of **14,800** lbs. applied, joist broke under load. 4 in. hanger, weight of **16.300** lbs. applied, oak upright crushed under boss of hanger. A slight fracture appeared under boss of bottom hangers, owing to bending due to crushing of timber, hangers otherwise O. K. after test.

OTIS IRON & STEEL CO.
G. B.

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HAHN'S

chine for Rolling Polygonal Beams, Columns,

AND OTHER ARTICLES OF IRON, STEEL, &c.

PATENT NO. 165,094, OF JUNE 29TH, 1875.

Fig. 1.

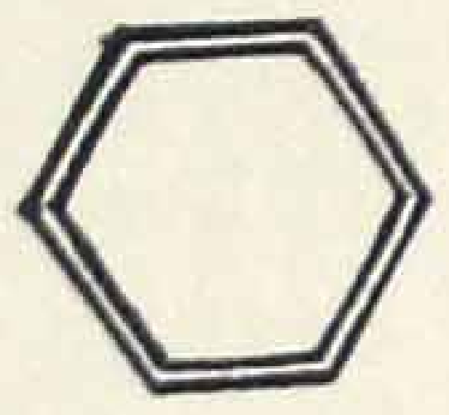


Fig. 2.

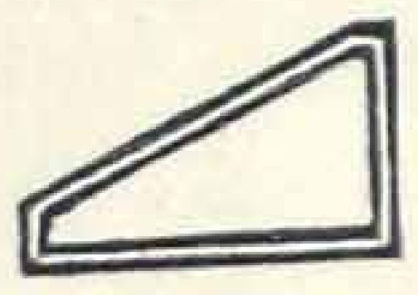


Fig. 3.

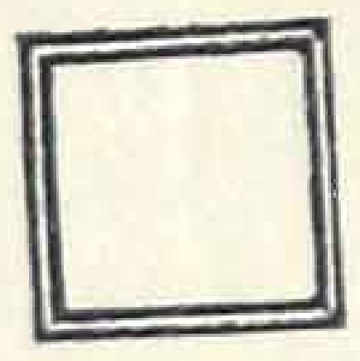


Fig. 4.

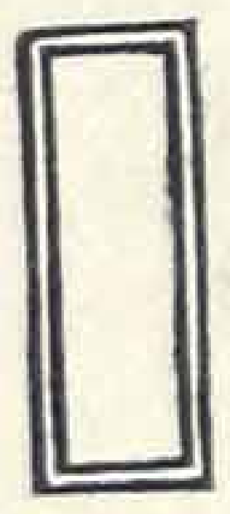


Fig. 5.

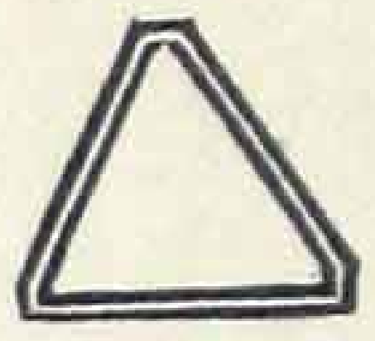
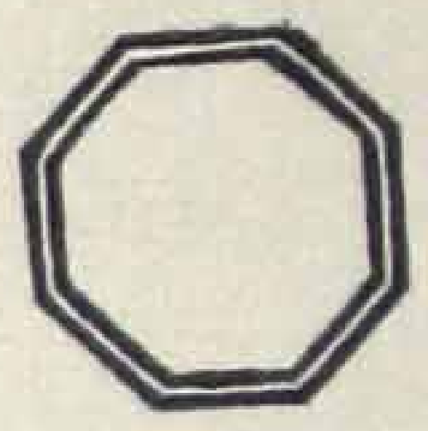


Fig. 6.



BEAMS, COLUMNS, &c., FOR BRIDGES, HOUSES AND OTHER STRUCTURES.

and the same set of Rolls can be made to roll, for instance, Beams from 3 inches up to 36 inches in height, in variations of $\frac{1}{32}$ inch or less in height or width: i. e., 3 inches, $3\frac{1}{32}$, $3\frac{1}{16}$, $3\frac{3}{32}$, $3\frac{1}{8}$, &c.

t eight per cent. of saving in metal by substituting hollow welded articles for solid or riveted ones of equal strength.

r $100,000.00 of saving alone in Rolls, as compared with the great number of sets of Rolls required in making solid articles of those various shapes.

ordinary Pipe coming from the welding rolls, is at once, and without reheating, transformed into either of the above, or any other sections desired.

he undersigned begs leave to call your attention to his lately nted machine, above referred to, of which the large size photo- ph sent herewith will give you a general idea.

his machine consists of the ordinary welding rolls of a Pipe l, to the front of which are several sets of plain horizontal s with proper guides between, and of plain vertical rolls, all nged in line in such a manner, that the moment the flat bar or lp is pushed out of the heating furnace, the welding rolls will sp it, accomplish the welding, and as each length leaves said lding rolls, it at once meets successively the different sets of rizontal and vertical rolls, which transform it from the ordinary nd shape, as obtained by the welding rolls, into such sections as strated by figs. 1 to 6, or any other shape desired, and thus pro- ce a beam, &c., in the same time as would otherwise be absorbed making an ordinary tube.

Such is the general mode of working, and the corresponding machine is shown by photograph enclosed herein; yet it is not imperative to confine the design to one compact structure, but the same may be divided into two separate machines to suit localities and circumstances.

For instance, the welding rolls may be left undisturbed in already existing Pipe Mills, and the transforming rolls placed either to the other end of, and in line with the table in front of the welding rolls, so that the pipe would reach the transforming rolls only after its entire length has passed through the welding rolls, and a perfect weld secured; or else the transforming machine could be set to the right or left of the welding rolls, the pipe when properly welded carried over and passed through the transforming machine, either backward or forward, and finished to any predetermined shape at one pass, and without reheating.

For production of none but rectangular shapes, the horizontal and vertical rolls are mounted in the ordinary way of setting rolls; while if it is the intention to manufacture all kinds of polygonal sections, see figs. 1, 2, 5, 6 and others, then the vertical, or the horizontal, or both kinds of rolls, with the guides, may be set in swivel boxes, the roll necks coupled to the driving shafts by means of universal couplings, as shown by photograph in case of the vertical rolls in front of the machine.

The riders of the roll necks and the guides are provided with screws, by means of which each roll and each guide may be set to and kept at the desired position, while the proper angle can be read off graduations, as illustrated on rider frames in front of the photograph.

Speaking of beams, it is a well known fact, that the further the metal is removed from the neutral axis of the beam the greater its carrying capacity, thus—

A 4-inch solid rolled beam, weighing 9 pounds per foot, and supported at a span of ten feet, will carry a load of one and two-third tons, while an 8-inch solid rolled beam, weighing 21½ pounds per foot, carries under the same conditions a load of eight tons, uniformly distributed over the whole span; that is, four times increased in strength by merely doubling in the height and weight. The same is the case in transforming, for instance, an ordinary 6-inch round pipe, weighing 18¾ pounds per foot into an 8-inch high beam on my rolls; here by simply changing the height from the original 6-inch to one of 8-inch, but without enlarging the weight of the beam, its carrying capacity is increased from 137 to 159, *i. e.*, 16 per cent.

When used as square, hexagonal, octagonal, or other polygonal column, my welded posts have the advantage of needing no punching, no riveting, nor any other mode of joining together the different segments, as with the present wrought iron built up columns, saving thereby a great deal in wages, now to be paid for marking off, punching and riveting, and also saving the cost of the rivets themselves.

In the construction of buildings, my hollow welded beams, columns, &c., may be used advantageously for a double purpose, to wit:

1st. For supporting and keeping together the whole structure.

2d. For ventilating the building, and for heating it by steam, hot water or hot air, allowing the gases and fluids to circulate through the beams, columns, &c., to any part of the house.

They can also be made use of for supplying the different stories of a house with hot water, cold water, gas, and some may answer as flues, or as chimneys for stoves, fire-grates and hot air furnaces.

Where it is desired to adhere to the present mode of laying ordinary gas and water pipes in the interior of houses, then the hollow columns, beams, &c., offer a facility to lay such pipes into the interior of the girders, &c., whereby leaking ones can at any time be readily replaced by good pipes without tearing up the plastering of the apartments, by simply pulling the same out through one end of the beam, &c., on removal of a cap at that end.

To give an idea of the economy attainable by the application such hollow metallic articles, it may be stated, that from plans a estimates made by the undersigned for four iron buildings, rangi in span from 25 feet to 80 feet, and in length from 60 feet to 3 feet, he found them to need only 106,067 pounds, at a cost $7,424, including fitting, while if solid and riveted shaped ir be taken, as hitherto done, 139,196 pounds, at a cost of $10,2 including fitting, would be necessary, showing a clear saving $2,845, or about 28 per cent. in favor of the hollow welded bea columns, &c., the larger part of which gain could go into pocket of the manufacturer. In the production of ordinary so rolled beams and segments for columns, there are from six to twe men required at the rolls, according to the lighter or heavier ki of work; while for my hollow polygonal beams, columns, &c., more men are needed than are at present attending a set of weld rolls of an ordinary Pipe Mill, *i. e.* but three.

In the former case, owing to the great cost of the rolls, and the cessity of a new set of rolls for every change in the height of solid beam and size of the columns, they make such only in lar steps, says 4, 5, 6, 7, 8, 9, 10, 12 and 15 inches for beams, 4, 6 10 and 12 inches for columns, and at this there must be alre some twenty-five sets of grooved rolls for roughing, preparing a finishing on hand, at a cost of about $30,000; while if the ma various angles should be rolled in solid, which my machine tu out in hollow with such great ease, rolls would have to be p cured amounting to over $100,000 in value.

On the other hand, with my machine, one and the same set rolls is capable of furnishing not only all sizes mentioned abo but in addition many thousands of others, because by a mere t of one wheel the horizontal and vertical rolls and the guides be changed, respectively approached to or receded from each ot and set at a different angle, all within fifteen minutes of time, then are ready to roll a section entirely different from what the sa rolls turned out fifteen minutes before; yet with all this, my r proper cost less than $2,000, are easily redressed when needed, the same rolls doing all kinds of work, a great saving is effec additionally, compared with grooved rolls, which must be remo from the housings and replaced by others when products of a ferent section have to be rolled to what had been done before, t causing loss of time and expense in wages to do it.

Enough has been said for enabling even the most casual obser to see the many advantages of my machine for rolling hol welded polygonal articles, and the profitable application of its p ducts, which is especially recommended to pipe manufacturers with their already existing machinery and furnaces, this additic machine will enable them to produce such hollow polygonal arti for but a small increase of investment; make beams like fig. 4, umns like figs. 1, 3 and 6, abutment beams like figs. 2 and 5 springing brick arches against, gutters like figs. 3 and 4, railing other objects, at a time when there is no demand for pipe, and *versa*, or make ordinary pipe and beams at the same time, and of the same furnace, as the case may be.

For Licenses, and further information, apply to **IGNATIUS HAHN,**

Engineer and Metallurgist,

P. O. Box 80, PITTSBURGH,